

## In the Claims

1 1. (currently amended) A compact electromagnetically ~~electrically and optically~~  
2 pumped multiwavelength photonic device ~~nanocavity~~ array comprising a plurality of  
3 nanocavities, each nanocavity defined in a photonic crystal in which each nanocavity  
4 is lithographically formed to define a corresponding predetermined spectral response  
5 of each nanocavity, said plurality of nanocavities forming a patterned ~~said~~ array of  
6 nanocavities.

1 2. (currently amended) The photonic device array of claim 1 where said spectral  
2 response of each nanocavity ~~which is lithographically formed defines~~ is defined by  
3 the wavelength of the electromagnetic wave which is supported in the photonic  
4 crystal by said lithographically defined nanocavity.

1 3. (currently amended) The photonic device array of claim 1 where said spectral  
2 response of each nanocavity ~~which is lithographically formed defines~~ is defined by  
3 the polarization of the electromagnetic wave which is supported by said  
4 lithographically defined nanocavity.

1 4. (currently amended) The photonic device array of claim 1 where said spectral  
2 response of each nanocavity ~~which is lithographically formed defines~~ is defined by  
3 the polarization and wavelength of the electromagnetic wave which is supported by  
4 said lithographically defined nanocavity.

1 5. (currently amended) The photonic device array of claim 1 where the photonic  
2 device comprises a laser and wherein said array of nanocavities is employed in the  
3 a-laser array.

1 6. (currently amended) The photonic device array of claim 1 where the photonic  
2 device comprises a detector and wherein said array of nanocavities is employed in  
3 the a-detector array.

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1 7. (currently amended) The photonic device array of claim 1 where the photonic  
2 device comprises an optical gate and wherein said array of nanocavities is employed  
3 in the an-all optical gate.

1 8. (currently amended) The photonic device array of claim 1 where the photonic  
2 device comprises an all optical router and wherein said array of nanocavities is  
3 employed in the an-all optical router.

1 9. (currently amended) The photonic device array of claim 1 where the photonic  
2 device comprises a modulator and wherein said array of nanocavities is employed in  
3 the a-modulator.

1 10. (currently amended) The photonic device array of claim 1 wherein an  
2 active quantum well is included in the photonic device and wherein said photonic

3 crystal in which the array of nanocavities are defined is formed in the active quantum  
4 well material.

1 11. (currently amended) The photonic device array of claim 1 where the  
2 photonic device comprises a vertical cavity surface emitting laser and wherein said  
3 array of nanocavities is ~~are employed in the~~ vertical cavity surface emitting lasers,  
4 VCSELs.

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1 12. (currently amended) The photonic device array of claim 11 wherein said  
2 nanocavities each have a volume size and wherein said volume size of each of said  
3 nanocavities is approximately a cubic half-wavelength ( $\lambda^3/2$ ).

1 13. (currently amended) The photonic device array of claim 1 comprises said array  
2 ~~is an array of lasers~~ each including an array of nanocavities and where at least one  
3 nanocavity laser is used as a pump for an adjacent nanocavity laser.

1 14. (currently amended) The photonic device array of claim 1 further comprising a  
2 nonlinear optical material filling said holes in the photonic crystal in which the array  
3 of nanocavities are defined.

1 15. (currently amended) The photonic device array of claim 14 wherein said  
2 photonic device with the array of nanocavities defined in the filled photonic crystal  
3 comprises ~~is~~ a tunable nanocavity laser, detector, router, gate or spectrometer array.

1 16. (currently amended) The photonic device array of claim 14 further comprising  
2 means for changing optical or electrical properties of said nonlinear optical material  
3 in each of said nanocavities.

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1 17. (currently amended) The photonic device array of claim 1 where said photonic  
2 crystals in which said array ~~is~~ are defined comprises a ~~in~~ Si-Ge materials on a silicon  
3 substrates disposed on an insulators.

1 18. (currently amended) The photonic device array of claim 17 further  
2 comprising a silicon slab waveguide or integrated circuit integrated with said array of  
3 nanocavities.

1 19. (currently amended) The photonic device array of claim 17 further  
2 comprising a nonlinear optical material filling said photonic crystal and means for  
3 changing optical or electrical properties of said nonlinear optical material  
4 surrounding ~~in~~ each of said nanocavities.

1        20.        (currently amended) The photonic device array of claim 1 further  
2        comprising a waveguiding layer disposed adjacent to said array of nanocavities, said  
3        waveguiding layer being transparent to light from said array and ~~is~~ critically coupled  
4        to said nanocavities in said array.

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